AMERICAN FORK CITY
GENERAL PLAN

Public Facilities and Services Element

DRAFT 2017 Sanitary Sewer System Master Plan
&
Impact Fee Facility Plan

Prepared by

HORROCKS
ENGINEERS

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Abbreviations

AAPR	Annual Percentage Growth Rate
CCI	Construction Cost Index
ERC	Equivalent Residential Connection (culinary water)
ERU	Equivalent Residential Unit (sanitary sewer)
DEQ	Division of Environmental Quality
fps	Feet per Second
gpd	Gallons per Day
gpdpc	Gallons per Day per Capita
IFFP	Impact Fee Facility Plan
MG	Million Gallons
MGD	Million Gallons per Day
PF	Peaking Factor
TSSD	Timpanogos Special Service District

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Chapter 1 - Summary and Recommendations

Introduction

Horrocks Engineers developed sanitary sewer system master plan updates for American Fork City in 1998 2008 & 2010 and made recommendations to provide for the capacity needed at build-out. The major reason for this current master plan update is to stay current with the needs of the City's sanitary sewer system and to stay current on impact fees.

In this study, American Fork City's future conditions are identified including the projected population, number of connections, developable areas, and wastewater flows. Using the projected population, design requirements, and historical wastewater flows, the flows are projected through the planning period.

A computer model was used to analyze the existing sanitary sewer system and determine its capacity. Then using the potential areas of development and the projected wastewater flows, improvements were identified to meet the needed capacities at buildout.

Measured flows from Timpanogos Special Service District (TSSD) were used to calibrate the computer model as were selected measurement sites within the City's collection system.

Residents of several neighboring communities are included in the City wastewater flow modeling because they discharge directly into the American Fork City boundary. Cedar Hills City discharges directly into the American Fork City sanitary sewer system while Lehi, Alpine, and Highland discharge into TSSD trunk lines that run through American Fork City boundaries. These projected flows have also been added to determine the long range pipe sizing requirements.

Projected Population

American Fork City currently has a population of 32,425 people. However, the City's population is projected to increase by 166 percent to 86,192 people by the year 2060. This growth will add an additional 19,786 equivalent residential units (ERUs) to the system.

Projected Sewer Flow

The peak monthly flow from American Fork in 2016 was 238 gallons per day/ERU which includes 198 gallons per day sewer generated and 40 gpd infiltration and inflow. Modeling for existing and future improvements is based on 198 gpd sewer generated per ERU and a unit infiltration and inflow rate based on the length and size of pipe. This allows future growth needs to be separated from base infiltration and inflow. Future

growth will contribute some infiltration and inflow but that will be based on the length and size of pipe versus the number of ERUs. The peak monthly flow is projected to increase from 94.67 million gallons (MG) to 251.66 MG. The peak daily flow is projected to be 2 times the peak monthly flow. This increase in flow has the potential to exceed 75% of the capacity of many of the TSSD outfall lines during peak flows. This increase will also cause a few of the existing collection lines in the City to exceed their design capacity as well.

Recommended Sanitary Sewer System Improvements

These recommendations were determined by using a computer model of American Fork City's sanitary sewer system and input from city staff. A detailed listing of the recommended improvements is given in the following paragraphs.

Existing Deficiency Improvement Plan

Table 1 shows improvements that are necessary to provide capacity for existing users. These improvements are shown in Figure 3 in the appendix.

Table 1 Improvements needed on Existing System

Item	Description	Cost
1	450 West Upsizing	$457,303
2		
	Grand Total	**$457,303**

March 2017 CCI = 10278
Costs are in 2017 dollars

Buildout Improvement Plan

Table 2 shows improvements that are necessary to provide capacity for future growth. These improvements are shown in Figure 4 in the appendix.

Table 2 Improvements Needed on Buildout System

Item	Description	Cost
1	400 West Upsizing	$478,746
2	Center Street Upsizing	$684,043
3	200 South Upsizing	$210,437
4	400 South Upsizing	$140,700
5	300 East Upsizing and Diversion	$143,546
6	860 East Area New	$665,637
7	Southside Buildout Improvements	$9,503,880
8	Cedar Hills Buildout Needs *	$1,112,389
	Grand Total	**$12,939,377**

March 2017 CCI = 10278
Costs are in 2017 dollars

Cedar Hills Buildout Needs are for information only and not for the calculations of impact fees for American Fork City users. The upsize and new capacity needed is for the benefit of Cedar Hills only (see Detailed cost estimates in the Appendix).

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Chapter 2 - Current and Future Conditions

Future conditions in American Fork City will affect the sanitary sewer flows and the improvements needed to handle these flows. As factors change, the projected future conditions made in this study could be affected. To help minimize the effect of the changing future conditions, the recommendations made in this study have been based upon the number of people served by American Fork City's culinary water system rather than time periods.

This chapter discusses American Fork City's population projections through the planning and ultimate build-out periods. The projected number of sanitary sewer connections has been determined based upon the projected population. In addition, using the potential areas of development, historical water demands, and State design requirements, the sanitary sewer flows projected through the planning and ultimate build-out periods are discussed.

Projected Population

Population projections have been determined for American Fork City by Mountainland Association of Governments (MAG) in ten (10) year increments until total build-out is reached near the year 2060. However, the MAG population projections do not take into account the Transit Oriented Development (TOD) area located south of Interstate 15. Additional "high density" population projections have been determined by InterPlan in ten (10) year increments that take the TOD development into account. Intermediate numbers for both the MAG and InterPlan population projections were calculated by interpolation and are shown in Table 3. American Fork City's projected population is also shown on Figure 1. The projected average annual percentage growth rate (AAPR) from 2016 to 2060 is approximately 2.36 percent. Figures 5 and 6 in the appendix show the current zoning and anticipated land use within American Fork City.

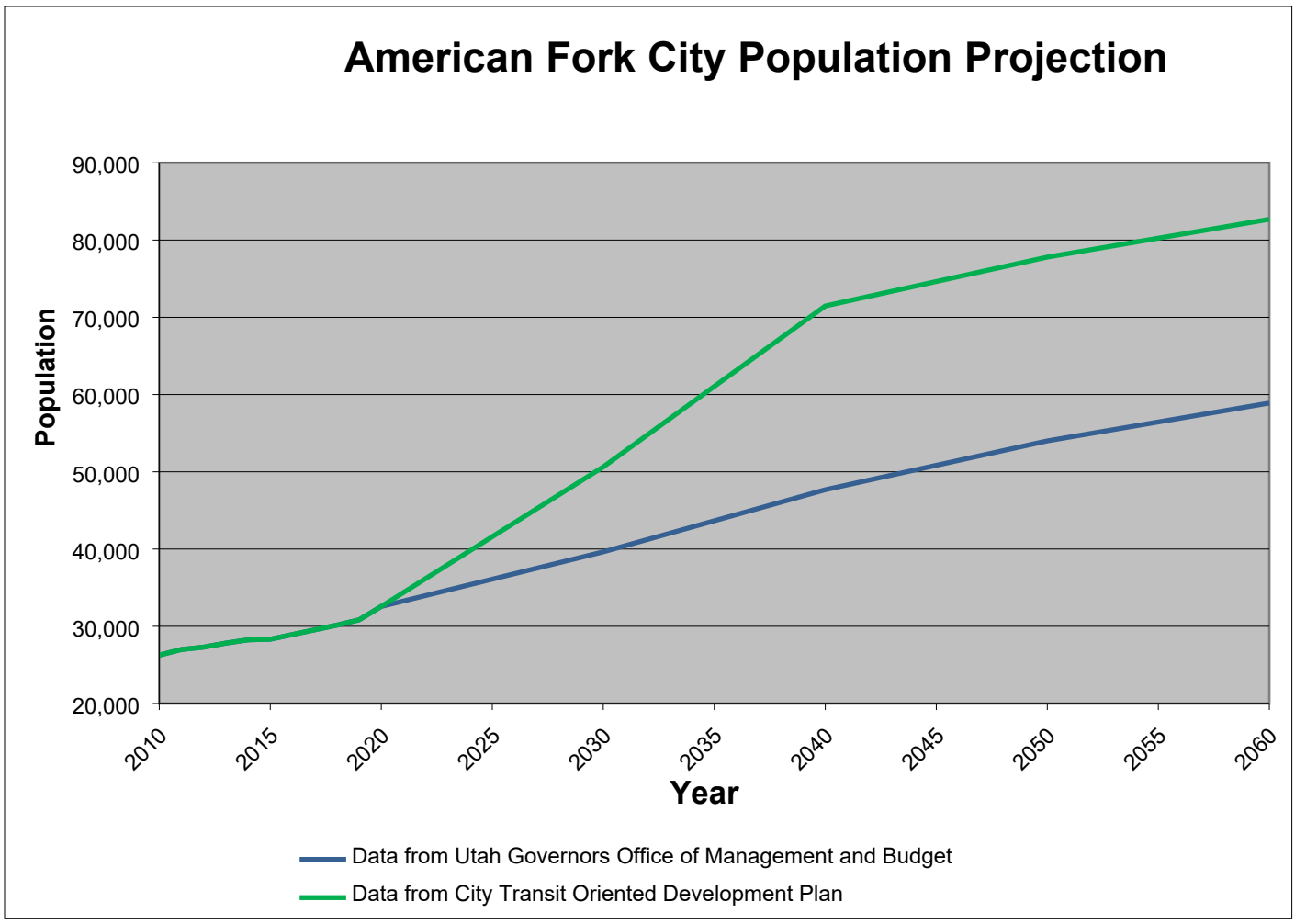

Figure 1 Population Projections

Equivalent Residential Unit (ERU)

Sanitary sewer flows are generated from residential, commercial, industrial, and institutional sources and it is advantageous to relate these sources in a quantifiable manner. It was determined in the culinary water master plan that an average residential home in American Fork City utilizes 205 gallons of culinary water per day most of which is discharged into the sewer. The average residential home is defined as an ERU for sanitary sewer purposes. For the purposes of this report an ERU is equivalent to an Equivalent Residential Connection (ERC) in the culinary water system. The ERU for some non-residential users was adjusted downward because they do not discharge most of their culinary usage into the sanitary sewer. Other sources such as churches, schools, and commercial businesses are compared to the average residential home to determine its ERU value. For example a commercial business who utilizes 615 gallons of culinary water and discharges most to the sanitary sewer system is assigned an ERU value of 3.0 because it generates three times the sanitary waste of an average home.

ERU's are anticipated to grow at the same rate as population. Table 1 also shows the projected ERU Growth.

Table 3 ERU Projections

Year	Population	Growth Rate	ERC's
2016	28,933	2.14%	11,932
2017	29,540	2.10%	12,162
2018	30,147	2.05%	12,391
2019	30,832	2.27%	12,652
2020	32,566	5.62%	13,342
2021	34,373	5.55%	14,059
2022	36,180	5.26%	14,775
2023	37,987	4.99%	15,487
2024	39,794	4.76%	16,198
2025	41,601	4.54%	16,906
2026	43,407	4.34%	17,611
2027	45,214	4.16%	18,314
2028	47,021	4.00%	19,015
2029	48,828	3.84%	19,713
2030	50,635	3.70%	20,409
2031	52,719	4.12%	21,215
2032	54,802	3.95%	22,017
2033	56,886	3.80%	22,817
2034	58,970	3.66%	23,614
2035	61,054	3.53%	24,408
2036	63,137	3.41%	25,199
2037	65,221	3.30%	25,988
2038	67,305	3.19%	26,774
2039	69,388	3.10%	27,558
2040	71,472	3.00%	28,339
2041	72,104	0.88%	28,541
2042	72,736	0.88%	28,743
2043	73,369	0.87%	28,944
2044	74,001	0.86%	29,144
2045	74,633	0.85%	29,343
2046	75,265	0.85%	29,542
2047	75,897	0.84%	29,740
2048	76,530	0.83%	29,937
2049	77,162	0.83%	30,133
2050	77,794	0.82%	30,329
2051	78,284	0.63%	30,469
2052	78,774	0.63%	30,608

2053	79,264	0.62%	30,746
2054	79,754	0.62%	30,884
2055	80,244	0.61%	31,021
2056	80,734	0.61%	31,158
2057	81,224	0.61%	31,294
2058	81,714	0.60%	31,429
2059	82,204	0.60%	31,564
2060	82,694	0.60%	31,699

Historical Sewer Flows

Sewer flows vary depending upon the amount of culinary water used and the amount of infiltration and inflow within the system. Figure 2 shows the historical sewer generated per month for American Fork City. The current average annual flow is 967 MG based on TSSD meter data. The current peak month was 86.33 MG. The current trend in flows generated per ERU is downward. This can be seen in figure 2 where total sanitary sewer flows have decreased over the past 8 years despite a growing population. This is a factor of both decreased culinary water usage and a concerted effort by City staff to identify and limit infiltration.

The peak monthly flow from American Fork in 2016 was 238 gallons per day/ERU which includes 198 gallons per day sewer generated and 40 gpd infiltration and inflow. Modeling for existing and future improvements is based on 198 gpd sewer generated per ERU and a unit infiltration and inflow rate based on the length and size of pipe. This allows future growth needs to be separated from base infiltration and inflow. Future growth will contribute some infiltration and inflow but that will be based on the length and size of pipe versus the number of ERUs. The unit infiltration and inflow rate used to model both current and future needs is the amount necessary to match 2016 flow plus nearly 60 percent to account for years of above normal groundwater and precipitation. This is in line with historical measured waste water flows.

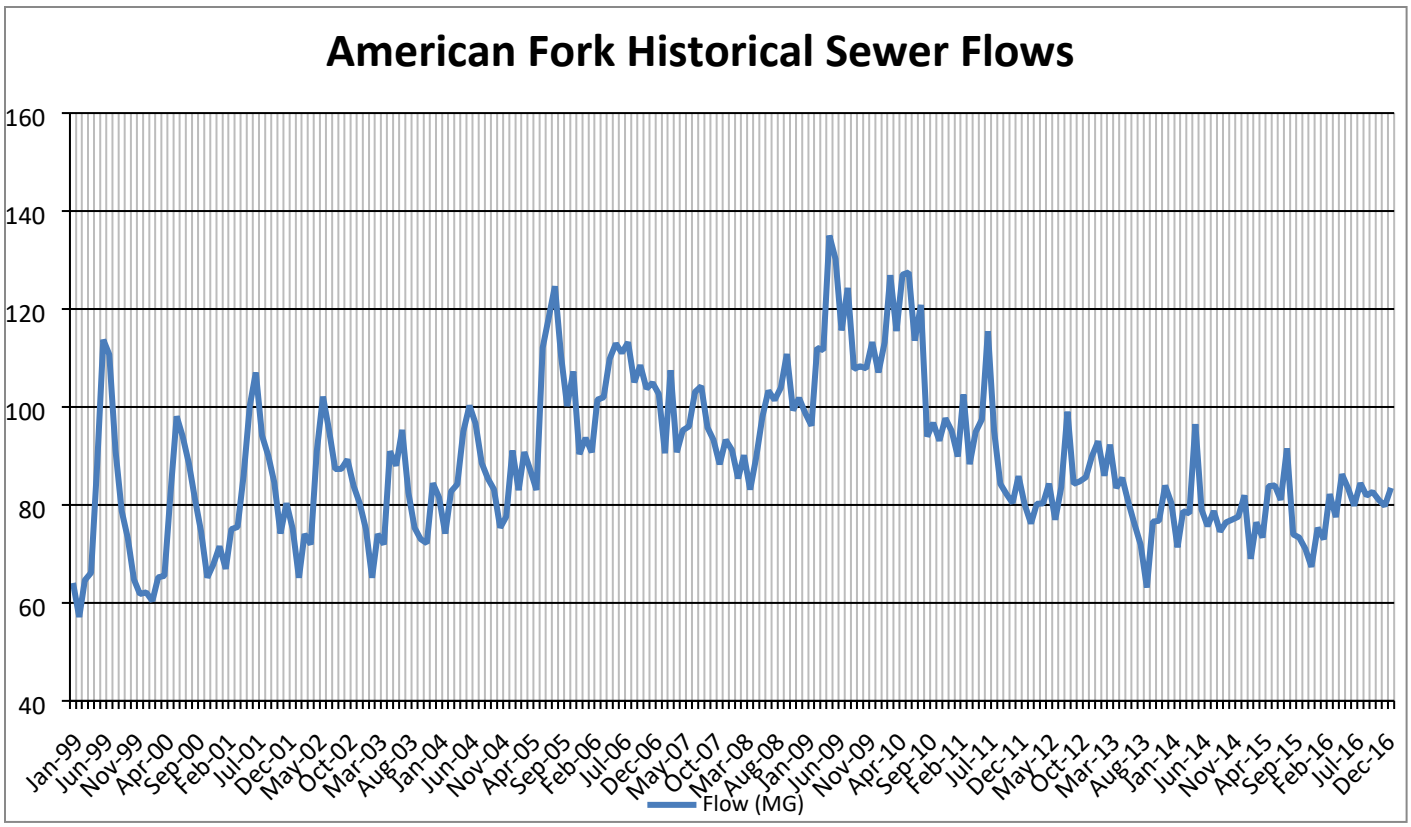

Figure 2 American Fork Historic Sewer Generation

Projected Sewer Flows

The projected population, historical sewer flows, and typical design criteria were used to project the sewer flows through the planning period. Projected sewer flows were entered into a computer program called *SewerGEMS* creating a model of American Fork City's existing sanitary sewer system.

Sewer lines are required to provide capacities for peak hourly and maximum daily flows. This variation of flows is due to the hydrograph or peak that is created by the wastewater as it enters the pipes and is collected from different areas. The farther the wastewater travels in the system, the smaller the peaks become. The "peak" in the flow or hydrograph is referred to as the peaking factor (PF) and is higher for collector lines (12" and smaller) than for trunk lines (larger than 12") because the peak is reduced as the wastewater flows downstream.

PFs for the American Fork City sewer model are based upon the historical wastewater flows, and typical design requirements. The model uses a variable PF of between 2.0 and 3.0 depending on how close the flow is to where it was generated. The PF's match closely with TSSD data at the meter leaving the City and individual meter locations. A typical PF for small municipal sanitary sewer system is 2.5. The State of Utah DEQ recommends a PF of 2.5 for over 12 inch lines and 4.0 for 12 inch and under lines for design purposes in the absence of measured flow data.

Using the projected ERCs and the peak daily flow, Table 4 shows the projected average yearly, average daily, peak monthly and peak daily flows through the planning period.

In summary, the number of ERCs is projected to increase by 19,786 ERU's by the year 2060. The average yearly flow is projected to increase from 967 MG to 2,570 MG. The States design standard is 100 gpd per person or approximately 370 gpd/ERU.

The recommendations in this capital facilities plan are based on 198 gpd/ERU plus a unit rate for infiltration and inflow. We believe this is high enough to provide a factor of safety while not being overly conservative given the ongoing efforts to limit infiltration and trend of decreasing culinary water demand. Using the State's design standards of 100 gpd per person would require significant improvements beyond what is actually needed.

Table 4 Projected Sewer Generation

Year	ERC's	Average Yearly (MG)	Peak Monthly (MG)	Average Daily (MGD)	Peak Daily (MGD)
2016	11,932	967	94.67	2.65	6.23
2017	12,162	985	96.50	2.70	6.35
2020	13,342	1,081	105.86	2.96	6.96
2025	16,906	1,370	134.14	3.75	8.82
2030	20,409	1,654	161.94	4.53	10.65
2035	24,408	1,978	193.66	5.42	12.74
2040	28,339	2,296	224.85	6.29	14.79
2045	29,343	2,378	232.82	6.51	15.32
2050	30,329	2,458	240.64	6.73	15.83
2055	31,021	2,514	246.13	6.89	16.19
Buildout	31,699	2,569	251.51	7.04	16.55

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Chapter 3 – Sanitary Sewer System Analysis

American Fork City's sanitary sewer system was analyzed to find the capacity of the current system and to determine the improvements needed to meet the flows of the projected population. In this chapter, a description of the existing sanitary sewer system is given along with a discussion of the concerns and recommended improvements. State and American Fork City standard requirements were used as criteria to analyze the sanitary sewer system. Information obtained from a computer model of American Fork's sanitary sewer system is presented with the recommended improvements needed to meet the projected population wastewater flows.

American Fork City currently has approximately 119 miles of sewer lines that collect the wastewater and convey it to TSSD outfall lines at the various locations. Figure 7 in the appendix shows the layout of the existing system. Collection lines in the City range from 8 inches to 36 inches and carry an average yearly flow of 967 MG of wastewater.

State Design Requirements

The Utah DEQ provides guidelines and regulations for new sanitary sewer system design. These guidelines are useful in new construction, but measured flows have shown that these guidelines are considerably higher than actual flows and would be unnecessary for the City to fully implement. Design guidelines from other sewer districts were reviewed to help develop local standards. It is recommended that American Fork City adopt the following criteria as the minimum level of service for the sanitary sewer system:

- New collector lines must be capable of carrying a minimum peak flow of 3 times the average flow.
- New interceptors and outfall lines must be capable of carrying a minimum peak flow of 2 times the average flow.
- The minimum size of a collection line is 8 inches.
- The minimum velocity of a line flowing full is two feet per second (2 fps).
- 8-inch thru 12-inch sewer lines are not to exceed 50 percent capacity (by depth) at peak flow.
- 15-inch and greater sewer lines are not to exceed 75 percent capacity (by depth) at peak flow.
- An ERU is equal to 198 gallons per day (gpd) average flow. This is based on each culinary ERC using 208 gallons per day, 95 percent of this flow going into the sanitary sewer, plus a unit rate for infiltration and inflow.

The sewer model uses a flow of 198 gpd/ERU plus a unit rate for infiltration and inflow.. These numbers compares favorably with recently measured flows (2016) from both the TSSD flow meter and individual portable meter verification. The sewer model also used a variable PF of 2.0 to 3.0.

The population capacity of different sewer line sizes is shown in Table 3. The capacities are calculated as shown. PFs are used to show maximum daily peaking flows with respect to whether the pipe is a collector or trunk line. As discussed in the previous chapter, trunk lines experience smaller peaks than collector lines.

Table 5 Pipe Design Standards

Size (in)	Percent Full	Minimum Slopes @ 2 fps (ft/ft)	Capacity @ Minimum Slope (MGD)	Peaking Factor	ERC Capacity @ 195 gpd
8	50	0.00334	0.24	3.00	410.26
10	50	0.00248	0.38	3.00	649.57
12	50	0.00194	0.55	3.00	940.17
15	75	0.00144	1.56	2.00	4000.00
18	75	0.00113	2.25	2.00	5769.23
21	75	0.00092	3.07	2.00	7871.79
24	75	0.00077	4.01	2.00	10282.05
27	75	0.00066	5.49	2.00	14076.92
30	75	0.00057	7.27	2.00	18641.03
36	75	0.00045	11.82	2.00	30307.69

Computer Model of Sanitary Sewer System

A computer program called *SewerGEMS (Bentley SewerGEMS Connect Edition)* was used to model American Fork City's sanitary sewer system. The program uses the flows generated at each sewer connection to calculate the full flow, maximum flow, and velocity of flow for each pipe. From the output of the model, the amount of wastewater flowing in each line can be determined. Information for the existing sanitary sewer system including the pipe diameters, lengths, manhole locations, and invert elevations, were obtained from the 2005 model. Additional sections of the model were added from the developments since the last update in 2005.

The number of ERUs was estimated based on build-out conditions with the 2016 zoning and assuming 20 percent of the area was used in the development of roadways, sidewalks, parks, etc. The flows generated by the number of ERUs achieved at build-out were entered into SewerGEMS allowing the flows to be routed into

existing lines. SewerGEMS was run to determine upgrades needed for demands on the existing sanitary sewer system and demands to be placed on the system during buildout.

The existing sanitary sewer system was modeled using PFs for both the present and future conditions. Each line that was flowing over either 50 percent of capacity for lines 12 inches and smaller or 75 percent of capacity for lines greater than 12 inches was then re-evaluated and recommendations made to provide lines with adequate capacities for the future conditions.

Existing Deficiency Improvement Plan

Table 6 shows improvements that are necessary to provide capacity for existing users. These improvements are shown in Figure 3 in the appendix.

Table 6 Improvements Needed on Existing System

Item	Description	Cost
1	450 West Upsizing	$457,303
2		
	Grand Total	**$457,303**

March 2017 CCI = 10278
Costs are in 2017 dollars

Buildout Improvement Plan

Table 7 shows improvements that are necessary to provide capacity for future growth. These improvements are shown in Figure 4 in the appendix.

Table 7 Improvements Needed on Buildout System

Item	Description	Cost
1	400 West Upsizing	$478,746
2	Center Street Upsizing	$684,043
3	200 South Upsizing	$210,437
4	400 South Upsizing	$140,700
5	300 East Upsizing and Diversion	$143,546
6	860 East Area New	$665,637
7	Southside Buildout Improvements	$9,503,880
8	Cedar Hills Buildout Needs *	$1,112,389
	Grand Total	**$12,939,377**

March 2017 CCI = 10278
Costs are in 2017 dollars

Cedar Hills Buildout needs are for information only and not for the calculations of impact fees for American Fork City users. The upsize and new capacity needed is for the benefit of Cedar Hills only (see Detailed cost estimates in the Appendix).

A summary of the recommended improvements, scheduling, and estimated costs is shown in Table 8. Figures 3 and 4 in the appendix shows the recommended improvements. Figure 8 in the appendix shows the anticipated capacity utilized at buildout. With contingencies, engineering, legal, and administrative fees, the total estimated cost is $130,919,527.

Table 8 Full Improvement Schedule

Fiscal Year	Description	Cost	% Benefit to Existing	Impact Expense	Operating Expense
2017-18	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	860 East Area New	$332,818	0.00%	$332,818	$0
2018-19	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	450 West Upsizing	$457,303	37.64%	$285,167	$172,137
2019-20	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	400 West Upsizing	$478,746	0.00%	$478,746	$0
2020-21	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	Center Street Upsizing	$342,022	0.00%	$342,022	$0
2021-22	5 Year Master Plan Update	$40,000	37.64%	$24,943	$15,057
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	Center Street Upsizing	$342,022	0.00%	$342,022	$0
2022-23	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	200 South Upsizing	$210,437	0.00%	$210,437	$0
2023-24	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	400 South Upsizing	$140,700	0.00%	$140,700	$0

2024-25	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	300 East Upsizing and Diversion	$143,546	0.00%	$143,546	$0
2025-26	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	860 East Area New	$332,818	0.00%	$332,818	$0
2026-27	5 Year Master Plan Update	$40,000	37.64%	$24,943	$15,057
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
2027-28	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
2028-29	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
2029-30	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
2030-35	Annual Master Plan Review	$56,000	37.64%	$34,921	$21,079
	System Replacement	$13,656,655	100.00%	$0	$13,656,655
	Southside Buildout Improvements	$1,187,985	0.00%	$1,187,985	$0
2035-40	Annual Master Plan Review	$56,000	37.64%	$34,921	$21,079
	System Replacement	$13,656,655	100.00%	$0	$13,656,655
	Southside Buildout Improvements	$1,187,985	0.00%	$1,187,985	$0
2040-45	Annual Master Plan Review	$56,000	37.64%	$34,921	$21,079
	System Replacement	$13,656,655	100.00%	$0	$13,656,655
	Southside Buildout Improvements	$1,187,985	0.00%	$1,187,985	$0
2045-50	Annual Master Plan Review	$56,000	37.64%	$34,921	$21,079
	System Replacement	$13,656,655	100.00%	$0	$13,656,655
	Southside Buildout Improvements	$1,187,985	0.00%	$1,187,985	$0
2050-55	Annual Master Plan Review	$56,000	0.00%	$56,000	$0
	System Replacement	$13,656,655	100.00%	$0	$13,656,655
	Southside Buildout Improvements	$1,187,985	0.00%	$1,187,985	$0
2055-60	Annual Master Plan Review	$56,000	37.64%	$34,921	$21,079
	System Replacement	$13,656,655	100.00%	$0	$13,656,655
	Southside Buildout Improvements	$475,194	0.00%	$475,194	$0
	Total Expenditures	**$130,191,527**		**$12,420,082**	**$117,771,445**

TSSD Connection Requirements

TSSD owns and operates several outfall lines in and through American Fork City. It is required that any development who wishes to connect a sewer line to a TSSD outfall line obtain the necessary permissions from TSSD prior to connecting. They have design and construction standards necessary to construct a proposed connection.

On any outfall line where American Fork City has a TSSD meter at the downstream end of the outfall line a connection can be made at any manhole that is within a City street for access purposes. The flowline shall be at or above the point where the 75 percent depth level matches in the discharging and receiving pipe.

On any outfall line where American Fork City does not have a TSSD meter at the downstream end a connection can only be made with a TSSD approved meter. The connection must have a minimum of 200 homes, preferably more, connected at buildout. The flowline shall be at or above the point where the 75 percent depth level matches in the discharging and receiving pipe. Additional fall through the metering device shall be incorporated in the design. The meter must be installed at any location that is within or adjacent to a City street for access purposes.

S E C T I O N

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Chapter 4 - Impact Fee Facility Plan (IFFP)

General Background

American Fork City has experienced significant growth in recent years. This growth, through the construction of homes, parks, commercial areas, and other amenities incidental to development, has added to the load on the City's sanitary sewer system. As development continues, additional sewer flows will be added to the sanitary sewer system. American Fork City's objective is to provide adequate sewer facilities to carry wastewater flows to TSSD in a safe and sanitary manner.

American Fork City adopted a sanitary sewer system component update of the General Plan in 1998, 2008, and 2010 to plan sewer facilities to carry wastewater flows. This plan update proposes guidelines and suggests controls for the design and installation of sewer facilities. The plan also establishes estimated costs associated with sewer facilities.

Required Elements of an IFFP

The purpose of this IFFP is to identify sewer demands placed on existing Sewer Facilities by new development and propose means by which American Fork City will meet these demands. Various funding possibilities for these facilities will also be discussed.

An IFFP, or its equivalent, must be in place if impact fees are to be considered as a financing source. Impact fees are one-time fees charged to new development to cover costs of increased capital facilities necessitated by new development. They are a critical financing source for American Fork City to consider, given the growth occurring in American Fork City.

According to Utah Code Title 11 Chapter 36a, known as the Impact Fee Act, local political subdivisions with a population of 5,000 or greater must prepare a separate IFFP before imposing impact fees unless the requirements of Utah Code Ann. §11-36-301 (3) (a) are included as part of the General Plan. Because the American Fork City General Plan does not satisfy these requirements, this IFFP has been prepared to meet the legal requirement.

Utah Code Ann. §11-36a-302 provides that the plan shall identify:

(i) Demands placed upon existing public facilities by new development activity; and
(ii) The proposed means by which the local political subdivision will meet those demands.

Demands on Existing Facilities

Service Area

American Fork City is located in the northern most portion of Utah County near the base of the Wasatch Mountains and includes an area of approximately 9.41 square miles. It is bordered on the West by Lehi, on the South by Utah Lake and Utah County, on the North by Highland, and on the East by Cedar Hills, Pleasant Grove and Lindon. Residents of several neighboring communities are included in the City wastewater flow modeling because they discharge directly into the American Fork City boundary. Cedar Hills City discharges directly into the American Fork City system while Lehi, Alpine, and Highland discharge into TSSD trunk lines that run through American Fork City boundaries. Existing land uses vary from pasture and farmland to high-density residential housing and commercial complexes. Therefore, the community can be classified as both rural and suburban.

American Fork City owns and operates a gravity sanitary sewer system that carries wastewater to TSSD outfall lines. With the exception of one private lift station near TSSD, the system operates by gravity flow.

Sanitary Sewer Design Requirements

The following is the minimum level of service to be provided by the sanitary sewer system in accordance with Utah Code Annotated, 11-36a-302(1)(a)(i) and (ii).

- New collector lines must be capable of carrying a minimum peak flow of 3 times the average flow.
- New interceptors and outfall lines must be capable of carrying a minimum peak flow of 2 times the average flow.
- The minimum size of a collection line is 8 inches.
- The minimum velocity of a line flowing full is two feet per second (2 fps).
- 8-inch thru 12-inch sewer lines are not to exceed 50 percent capacity (by depth) at peak flow.
- 15-inch and greater sewer lines are not to exceed 75 percent capacity (by depth) at peak flow.
- An ERU is equal to 198 gallons per day (gpd) average flow. This is based on each culinary ERC using 208 gallons per day, 95 percent of this flow going into the sanitary sewer, plus a unit rate for infiltration and inflow.

As sewer lines reach the 50 percent or 75 percent capacity point, they are deemed undersized and should be upsized. The reason behind the lower capacity is to provide a buffer during abnormal peak flows. Once a pipe reaches 100 percent capacity, the system will start to surcharge which may result in flooding basements, etc.

Existing Sewer Facilities

Existing conditions at the time of this study were established using data collected from the City as well as flow data generated specifically for the Master Plan. Some of the data gathered and used includes an existing sewer model, the existing sewer master plan, existing City maps, and field flow data. Figure 7 in

the appendix shows American Fork's existing sanitary sewer system and facilities.

Connections to the sanitary sewer system include residential, school, church, commercial, and City owned facility connections for a total of 11,932 ERU's.

Deficiencies Based on Existing Development

The following deficiencies are identified in accordance with Utah Code Annotated, 11-36a-302(1)(a)(iv). Table 9 shows improvements that are necessary to provide capacity for existing users. These improvements are shown in Figure 3 in the appendix. The proposed upsize to meet existing conditions will also meet the needs of growth and therefore costs should be split equally be between new and existing users.

Table 9 Improvements Needed on Existing System

Item	Description	Cost
1	450 West Upsizing	$457,303
2		
	Grand Total	**$457,303**

March 2017 CCI = 10278
Costs are in 2017 dollars

Future Demand and Capital Facilities

The following sections identify the future infrastructure required to meet the demand of new development in accordance with Utah Code Annotated, 11-36a-302(1)(a)(v).

Future Sewer Requirements

The same design requirements for the current system will apply for future development. All new development will be required to install a minimum of an 8-inch sewer line or the appropriate size to serve their development, whichever is larger.

Future Capital Sewer Facilities

Future conditions at the time of this study were established using data collected from the City. A buildout sewer model was created with the projected sanitary sewer system using the buildout number of ERUs. Table 10 and Figure 4 in the appendix shows American Fork's buildout sanitary sewer system and facilities.

Table 10 Buildout System Improvements

Item	Description	Cost
1	400 West Upsizing	$478,746
2	Center Street Upsizing	$684,043

3	200 South Upsizing	$210,437
4	400 South Upsizing	$140,700
5	300 East Upsizing and Diversion	$143,546
6	860 East Area New	$665,637
7	Southside Buildout Improvements	$9,503,880
8	Cedar Hills Buildout Needs *	$1,112,389
	Grand Total	**$12,939,377**

March 2017 CCI = 10278
Costs are in 2017 dollars

Buildout connections to the sanitary sewer system include residential, school, church, commercial, and City owned facility connections for a total of 31,786 ERU's.

Cedar Hills Buildout needs are for information only and not for the calculations of impact fees for American Fork City users. The upsize and new capacity needed is for the benefit of Cedar Hills only (see Detailed cost estimates in the Appendix).

Capital Facility Cost and Proportionate Share

Cost of Capital Facilities
Detailed engineer's estimates of cost are described in the appendix. A summary of those costs are included in Table 9 and 10 above. These costs are associated with master planned improvements in order to properly handle future development demands and are thus eligible for inclusion in an impact fee. Only that portion of the capital facilities that will benefit growth in the 10 year planning period are eligible for inclusion. An appropriate inflation factor can be incorporated in the analysis to cover rising costs in the future.

Cost of Master Planning
The City expects to expend money every year to review the sanitary sewer master plan, IFFP, and IFA and every five years to fully update the same. These costs are eligible for inclusion in an impact fee. Only that portion of the master planning that will benefit growth in the 10 year planning period are eligible for inclusion. An appropriate inflation factor can be incorporated in the analysis to cover rising costs in the future.

Value of Free Capacity in Sanitary Sewer System
The existing sanitary sewer system has excess capacity or free capacity available for future growth. It is acceptable for future users to pay for their portion of the existing system through an impact fee to reimburse existing users in accordance with Utah Code Annotated, 11-36a-302(1)(a)(iii). The free capacity portion of the impact fee can be utilized to repay the exiting culinary water enterprise account to recoup actual costs spent on the original system improvements. Only actual costs can be utilized in this analysis and not current replacement costs or inflation adjusted costs.

The City's sanitary sewer collection system consists of 119 miles of 8 to 36 inch pipe. Only 1.27 percent of the collection system will need to be upsized for growth therefore 98.73 percent of the system has excess capacity for future growth. The cost of 98.73 percent of the system can be split between existing and future users to determine the value of free capacity in the system.

Cost Associated with Existing Deficiencies

As described previously, the existing sanitary sewer system has one deficiency. Costs associated with existing deficiencies cannot be included in an impact fee analysis (IFA). In this case the solution to fix the existing deficiency will also provide capacity for buildout therefore the total cost can be split between existing and future users.

Developer Contributions

As growth occurs throughout the City, developers are required to install minimum size sewer lines to serve the homes within their development. Sometimes lines throughout the City need to be upsized to accommodate homes outside the development. The City collects impact fees from all development to cover the cost of upsizing. The detailed cost estimates prepared in the Master Plan only include those costs related to upsizing developer provided facilities or wholly City constructed facilities. No impact fees can be collected for developer provided facilities.

10 Year Improvement Schedule

Table 8 provides the anticipated schedule for master planning and improvement construction. The costs represent present value in 2017 dollars.

Table 11 10-Year Improvement Schedule

Fiscal Year	Description	Cost	% Benefit to Existing	Impact Expense	Operating Expense
2017-18	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	860 East Area New	$332,818	0.00%	$332,818	$0
2018-19	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	450 West Upsizing	$457,303	37.64%	$285,167	$172,137
2019-20	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0

	400 West Upsizing	$478,746	0.00%	$478,746	$0
2020-21	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	Center Street Upsizing	$342,022	0.00%	$342,022	$0
2021-22	5 Year Master Plan Update	$40,000	37.64%	$24,943	$15,057
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	Center Street Upsizing	$342,022	0.00%	$342,022	$0
2022-23	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	200 South Upsizing	$210,437	0.00%	$210,437	$0
2023-24	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	400 South Upsizing	$140,700	0.00%	$140,700	$0
2024-25	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	300 East Upsizing and Diversion	$143,546	0.00%	$143,546	$0
2025-26	Annual Master Plan Review	$4,000	37.64%	$2,494	$1,506
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	860 East Area New	$332,818	0.00%	$332,818	$0
2026-27	5 Year Master Plan Update	$40,000	37.64%	$24,943	$15,057
	System Replacement	$2,731,331	100.00%	$0	$2,731,331
	Southside Buildout Improvements	$237,597	0.00%	$237,597	$0
	Total Expenditures	**$32,581,692**		**$5,054,086**	**$27,527,606**

Revenue Source to Finance Impacts to System Improvements

The following revenue sources to finance impact on system improvements are identified in accordance with Utah Code Annotated, 11-36a-302(2).

General Fund Revenues

While general fund revenues can be used to fund capital facilities, they are generally insufficient to meet the demands of large infrastructure projects. General fund revenues are mainly drawn from property, sales, and franchise tax revenues.

Grants and Donations

Grants monies or low interest loans for capital facilities may be available through a variety of state and

federal programs. Competition for these types of funds is often strong, but they should not be overlooked as a potential funding source.

Sewer Utility

Most municipalities have enacted a sewer utility to pay the cost of capital facilities. A sewer utility would charge all residents a monthly fee based on winter water usage. Monthly fees could then be used to maintain the system and/or construct capital facility improvements.

Impact Fees

Impact fees are an important means of financing future water capital facility improvements, especially given the growth American Fork City is experiencing. The fees collected can be used for infrastructure as outlined in this IFFP. Impact fees are a one-time fee charged to new development that allow development to "pay its own way" in terms of the additional costs cities experience when growth occurs. Impact fees must meet the requirements of Utah law, must demonstrate that there is a rational connection between the fees charged to correct deficiencies in an existing system, and must provide that adjustment to impact fees be made to appropriately credit any significant past payments or anticipated future payments to capital facilities. This is to insure that the new development is not "double charged" for capital facilities. Impact fees are necessary in order to achieve an equitable allocation between the costs borne in the past and the cost to be borne in the future. Existing residential and businesses are well served by the existing sanitary sewer system. However, with additional growth improvements and expansion of the sanitary sewer system will be needed to provide adequate service.

Debt Financing

American Fork City can also fund sewer facilities through bonding. Bonding is often a good approach when large sums are needed up-front because it allows the payments to be spread over a longer time period. American Fork City does have a revenue source in sewer user rates to back a debt service payment for sanitary sewer system improvements. Bonding can be obtained on the open market or through governmental agencies such as the Utah Division of Water Quality.

IFFP Certification

I certify that the attached impact fee facility plan (IFFP):

1. includes only the costs of public facilities that are:
    a. allowed under the Impact Fees Act; and
    b. actually incurred; or
    c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;
2. does not include:
    a. costs of operation and maintenance of public facilities;
    b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents;
    c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and the methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement; and
3. offset costs with grants or other alternate sources of payment; and
4. complies in each and every relevant respect with the Impact Fees Act.

This certification made in accordance with Utah Code Annotated, 11-36a-306(1), with the following caveats:

1. All of the recommendations for implementation of the IFFP made in the IFFP are followed in their entirety by American Fork City staff and Council in accordance to the specific policies established for the service area.
2. If all or a portion of the IFFP are modified or amended, this certification is no longer valid.
3. All information provided to Horrocks Engineers, its contractors or suppliers is assumed to be correct, complete and accurate. This includes information provided by American Fork City and outside sources.

Date _____

_____
John E. Schiess, P.E.
Horrocks Engineers

APPENDIX

Legend

- Manholes
- Other
- NEW 10
- NEW 12
- NEW 15
- NEW 8
- TSSD
- UPSIZE 10
- UPSIZE 12
- UPSIZE 14
- UPSIZE 18
- American Fork
- Parcels
- Roads

1:24,000

HORROCKS ENGINEERS

2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

Sanitary Sewer System Master Plan

Existing Sanitary Sewer System Improvements

DATE 3/28/2017

DRAWN JES

Figure 3

Legend

LABEL

- Treatment Plant
- Existing Meter
- Lift Station
- New Meter
- New Meter
- New Meter
- Manholes
- Other
- NEW 10
- NEW 12
- NEW 15
- NEW 8
- TSSD
- UPSIZE 10
- UPSIZE 12
- UPSIZE 14
- UPSIZE 18
- American Fork
- Parcels
- Roads

1:24,000

HORROCKS ENGINEERS
2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

Sanitary Sewer System Master Plan

Buildout Sanitary Sewer System Improvements

DATE 3/28/2017
DRAWN JES
Figure 4

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1:25,000

Legend

- American Fork
- Parcels
- Roads

Zoning

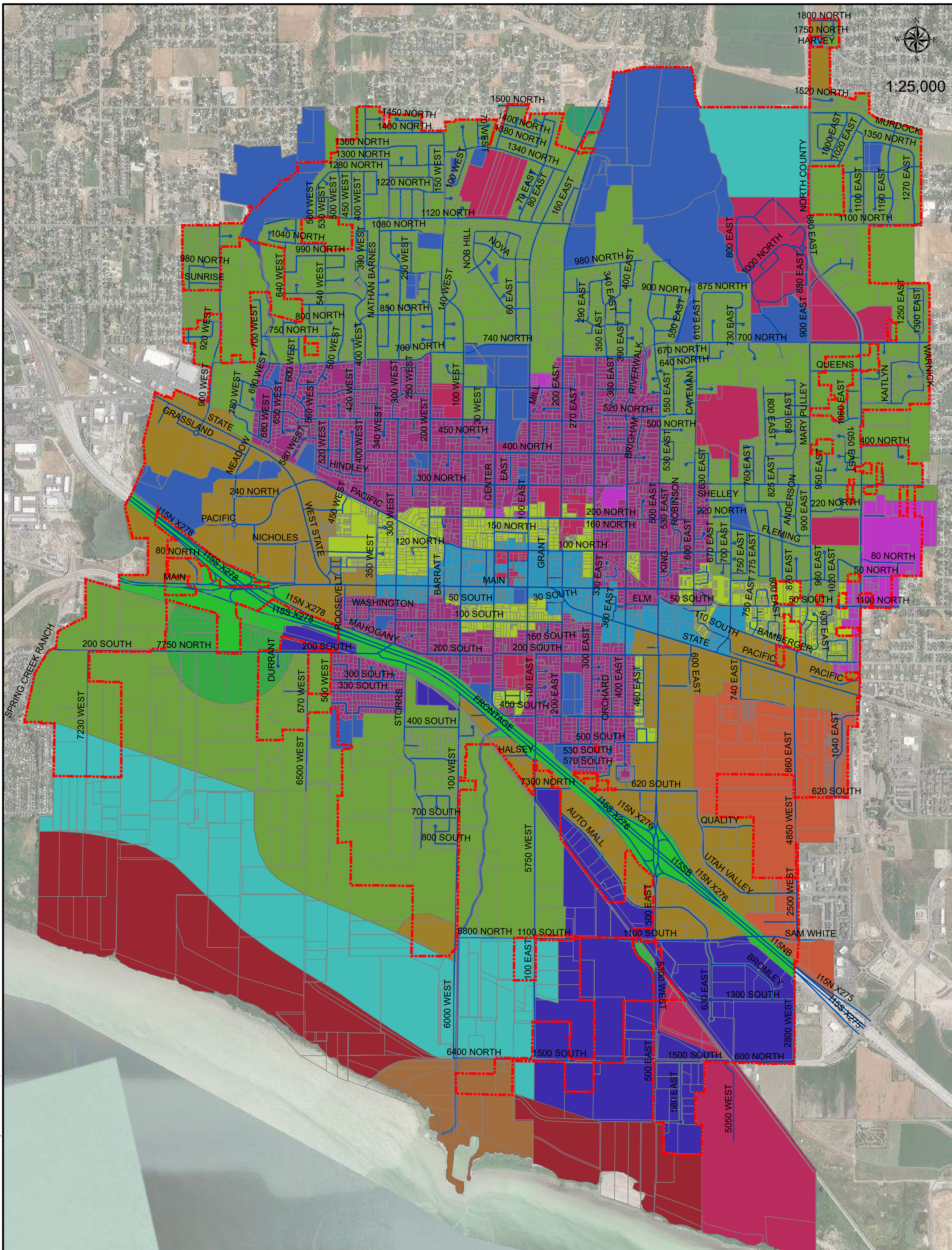
- CC-1
- CC-2
- GC-1
- GC-2
- I-1
- M-1
- PC
- PF
- PI-1
- PO-1
- PR-2.3
- PR-3.0
- R1-12000
- R1-15000
- R1-20000
- R1-7500
- R1-9000
- R2-7500
- R3-7500
- R4-7500
- RA-1
- RA-5
- S-1
- SC-1

HORROCKS ENGINEERS
2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

Pressurized Irrigation System Master Plan

Existing Zoning

DATE 3/28/2017
DRAWN BCC
Figure 5



Legend

Land Use

- Design Commercial
- Design Industrial
- General Commercial
- Institutional Lands, Schools and Public Facilities
- Major Transportation Facilities
- Neighborhood Commercial
- Planned Community
- Professional Office
- Public Parks & Open Space
- Residential High Density
- Residential Low Density
- Residential Medium Density
- Residential Very- Low Density
- Resort
- Shoreline Protection
- Transit Oriented Development
- American Fork
- Parcels
- Roads

HORROCKS ENGINEERS	2162 West Grove Parkway Suite 400 Pleasant Grove, UT 84062 (801) 763-5100	Culinary Water System Master Plan General Plan Anticipated Land Use	DATE 3/28/2017 DRAWN JES Figure 6

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Legend

Manhole

Diamiter (Inch)

- 8
- 9.4
- 10
- 11.2
- 12
- 12.3
- 14.1
- 15
- 15.8
- 18
- 21
- 24
- 30
- 36
- 42

American Fork

Parcels

Roads

1:24,000

HORROCKS ENGINEERS

2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

Sanitary Sewer System Master Plan

Existing Sanitary Sewer System

DATE 3/28/2017

DRAWN JES

Figure 7

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Legend

LABEL

- WTP — Treatment Plant
- Existing Meter
- PS — Lift Station
- New Meter
- New Meter
- New Meter
- Manholes

Percent Full

- 0.0 - 12.5
- 12.5 - 50.0
- 50.0 - 75.0
- 75.0 - 100.0
- American Fork
- Parcels
- Roads

1:24,000

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HORROCKS ENGINEERS

2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

Sanitary Sewer System Master Plan

Buildout Sanitary Sewer System Improvements

DATE 3/28/2017

DRAWN JES

Figure 8

Table 12 Outflow Data Provided by Cedar Hills

Existing ERUs	2,596
Existing Ave day, peak month (gallons/day)	732,000
Flow/ERU (gallons/day)	282
Peak Hour Peaking Factor	2.5

@ 282 gpd/ERU	Cedar Hills			Others					
Outfall	Existing ERUs	Future Residential ERUs	Future Commercial ERUs	Pleasant Grove ERUs	Highland ERUs	Lone Peak High School	Total ERUs	Future Peak Month, Ave. Day (gals/day)	Future Peak Hour (gals/day)
I - 4600 West	1,206	155	90				1,451	409,142	1,022,854
II - 4500 West	953	155		200			1,308	368,820	922,049
III - 4800 West	437	150	190		80	111	968	272,900	682,251
Total	2,596	460	280		80	111	3,727	1,050,862	2,627,154

@ 355 gpd/ERU	Cedar Hills			Others					
Outfall	Existing ERUs	Future Residential ERUs	Future Commercial ERUs	Pleasant Grove ERUs	Highland ERUs	Lone Peak High School	Total ERUs	Future Peak Month, Ave. Day (gals/day)	Future Peak Hour (gals/day)
I - 4600 West	1,206	155	90				1,451	515,105	1,287,763
II - 4500 West	953	155		200			1,308	464,340	1,160,850
III - 4800 West	437	150	190		80	88	945	335,485	838,713
Total	2,596	460	280		80	88	3,704	1,314,930	3,287,325

Table 13 Detailed Cost Estimates

450 West Upsizing

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$16,623
2	8 inch PVC		LF	$80.00	$0
3	10 inch PVC		LF	$85.00	$0
4	12 inch PVC	979	LF	$93.00	$91,047
5	15 inch PVC		LF	$105.00	$0
6	18 inch PVC		LF	$120.00	$0
7	21 inch PVC		LF	$135.00	$0
8	24 inch PVC		LF	$160.00	$0
9	30 inch PVC		LF	$190.00	$0
10	36 inch RCP		LF	$220.00	$0
12	5 foot manholes	8	EA	$3,500.00	$28,000
13	6 foot manholes		EA	$4,500.00	$0
14	8 foot manholes		EA	$6,000.00	$0
15	Service Connections	50	EA	$1,850.00	$92,500
16	TSSD Meter Station		EA	$125,000.00	$0
17	Class "A" Road Repair (10 ft/lin ft)	9,790	SF	$4.50	$44,055
18	Imported Backfill (60 cf/lin ft)	3,916	TON	$18.00	$70,488
19	Traffic Control	1	LS	$1,820.94	$1,821
20	Bypass Pumping	1	LS	$4,552.35	$4,552
	Sub Total (Construction)				$349,086
	Contingencies	15%			$52,363
	Total (Construction)				$401,449
	Design and Construction Engineering	15%			$52,363
	Administration, Legal, and Bond Counsel	1%			$3,491
	Total (Professional Services)				$55,854
	Grand Total				**$457,303**

March 2017 CCI = 10278

Data From Sewer Model Data Base

Costs are in 2017 dollars

400 West Upsizing

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$17,403
2	8 inch PVC		LF	$80.00	$0
3	10 inch PVC		LF	$85.00	$0
4	12 inch PVC	1,051	LF	$93.00	$97,743
5	15 inch PVC		LF	$105.00	$0
6	18 inch PVC		LF	$120.00	$0
7	21 inch PVC		LF	$135.00	$0
8	24 inch PVC		LF	$160.00	$0
9	30 inch PVC		LF	$190.00	$0
10	36 inch RCP		LF	$220.00	$0
12	5 foot manholes	8	EA	$3,500.00	$28,000
13	6 foot manholes		EA	$4,500.00	$0
14	8 foot manholes		EA	$6,000.00	$0
15	Service Connections	50	EA	$1,850.00	$92,500
16	TSSD Meter Station		EA	$125,000.00	$0
17	Class "A" Road Repair (10 ft/lin ft)	10,510	SF	$4.50	$47,295
18	Imported Backfill (60 cf/lin ft)	4,204	TON	$18.00	$75,672
19	Traffic Control	1	LS	$1,954.86	$1,955
20	Bypass Pumping	1	LS	$4,887.15	$4,887
	Sub Total (Construction)				$365,455
	Contingencies	15%			$54,818
	Total (Construction)				$420,273
	Design and Construction Engineering	15%			$54,818
	Administration, Legal, and Bond Counsel	1%			$3,655
	Total (Professional Services)				$58,473
	Grand Total				**$478,746**

March 2017 CCI = 10278
Data From Sewer Model Data Base
Costs are in 2017 dollars

Center Street Upsizing

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$24,865
2	8 inch PVC		LF	$80.00	$0
3	10 inch PVC	1,900	LF	$85.00	$161,500
4	12 inch PVC		LF	$93.00	$0
5	15 inch PVC		LF	$105.00	$0
6	18 inch PVC		LF	$120.00	$0
7	21 inch PVC		LF	$135.00	$0
8	24 inch PVC		LF	$160.00	$0
9	30 inch PVC		LF	$190.00	$0
10	36 inch RCP		LF	$220.00	$0
12	5 foot manholes	7	EA	$3,500.00	$24,500
13	6 foot manholes		EA	$4,500.00	$0
14	8 foot manholes		EA	$6,000.00	$0
15	Service Connections	42	EA	$1,850.00	$77,700
16	TSSD Meter Station		EA	$125,000.00	$0
17	Class "A" Road Repair (10 ft/lin ft)	19,000	SF	$4.50	$85,500
18	Imported Backfill (60 cf/lin ft)	7,600	TON	$18.00	$136,800
19	Traffic Control	1	LS	$3,230.00	$3,230
20	Bypass Pumping	1	LS	$8,075.00	$8,075
	Sub Total (Construction)				$522,170
	Contingencies	15%			$78,326
	Total (Construction)				$600,496
	Design and Construction Engineering	15%			$78,326
	Administration, Legal, and Bond Counsel	1%			$5,222
	Total (Professional Services)				$83,547
	Grand Total				**$684,043**

March 2017 CCI = 10278
Data From Sewer Model Data Base
Costs are in 2017 dollars

200 South Upsizing

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$7,649
2	8 inch PVC		LF	$80.00	$0
3	10 inch PVC	615	LF	$85.00	$52,275
4	12 inch PVC		LF	$93.00	$0
5	15 inch PVC		LF	$105.00	$0
6	18 inch PVC		LF	$120.00	$0
7	21 inch PVC		LF	$135.00	$0
8	24 inch PVC		LF	$160.00	$0
9	30 inch PVC		LF	$190.00	$0
10	36 inch RCP		LF	$220.00	$0
12	5 foot manholes	4	EA	$3,500.00	$14,000
13	6 foot manholes		EA	$4,500.00	$0
14	8 foot manholes		EA	$6,000.00	$0
15	Service Connections	6	EA	$1,850.00	$11,100
16	TSSD Meter Station		EA	$125,000.00	$0
17	Class "A" Road Repair (10 ft/lin ft)	6,150	SF	$4.50	$27,675
18	Imported Backfill (60 cf/lin ft)	2,460	TON	$18.00	$44,280
19	Traffic Control	1	LS	$1,045.50	$1,046
20	Bypass Pumping	1	LS	$2,613.75	$2,614
	Sub Total (Construction)				$160,639
	Contingencies	15%			$24,096
	Total (Construction)				$184,735
	Design and Construction Engineering	15%			$24,096
	Administration, Legal, and Bond Counsel	1%			$1,606
	Total (Professional Services)				$25,702
	Grand Total				**$210,437**

March 2017 CCI = 10278

Data From Sewer Model Data Base

Costs are in 2017 dollars

400 South Upsizing

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$5,115
2	8 inch PVC		LF	$80.00	$0
3	10 inch PVC		LF	$85.00	$0
4	12 inch PVC		LF	$93.00	$0
5	15 inch PVC		LF	$105.00	$0
6	18 inch PVC	350	LF	$120.00	$42,000
7	21 inch PVC		LF	$135.00	$0
8	24 inch PVC		LF	$160.00	$0
9	30 inch PVC		LF	$190.00	$0
10	36 inch RCP		LF	$220.00	$0
12	5 foot manholes		EA	$3,500.00	$0
13	6 foot manholes	2	EA	$4,500.00	$9,000
14	8 foot manholes		EA	$6,000.00	$0
15	Service Connections	4	EA	$1,850.00	$7,400
16	TSSD Meter Station		EA	$125,000.00	$0
17	Class "A" Road Repair (10 ft/lin ft)	3,500	SF	$4.50	$15,750
18	Imported Backfill (60 cf/lin ft)	1,400	TON	$18.00	$25,200
19	Traffic Control	1	LS	$840.00	$840
20	Bypass Pumping	1	LS	$2,100.00	$2,100
	Sub Total (Construction)				$107,405
	Contingencies	15%			$16,111
	Total (Construction)				$123,515
	Design and Construction Engineering	15%			$16,111
	Administration, Legal, and Bond Counsel	1%			$1,074
	Total (Professional Services)				$17,185
	Grand Total				**$140,700**

March 2017 CCI = 10278

Data From Sewer Model Data Base

Costs are in 2017 dollars

300 East Upsizing and Diversion

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$5,218
2	8 inch PVC		LF	$80.00	$0
3	10 inch PVC	410	LF	$85.00	$34,850
4	12 inch PVC		LF	$93.00	$0
5	15 inch PVC		LF	$105.00	$0
6	18 inch PVC		LF	$120.00	$0
7	21 inch PVC		LF	$135.00	$0
8	24 inch PVC		LF	$160.00	$0
9	30 inch PVC		LF	$190.00	$0
10	36 inch RCP		LF	$220.00	$0
12	5 foot manholes	2	EA	$3,500.00	$7,000
13	6 foot manholes		EA	$4,500.00	$0
14	400 North 300 East Diversion (15% W 85% S)	1	EA	$1,000.00	$1,000
15	Service Connections	6	EA	$1,850.00	$11,100
16	TSSD Meter Station		EA	$125,000.00	$0
17	Class "A" Road Repair (10 ft/lin ft)	4,100	SF	$4.50	$18,450
18	Imported Backfill (60 cf/lin ft)	1,640	TON	$18.00	$29,520
19	Traffic Control	1	LS	$697.00	$697
20	Bypass Pumping	1	LS	$1,742.50	$1,743
	Sub Total (Construction)				$109,577
	Contingencies	15%			$16,437
	Total (Construction)				$126,014
	Design and Construction Engineering	15%			$16,437
	Administration, Legal, and Bond Counsel	1%			$1,096
	Total (Professional Services)				$17,532
	Grand Total				**$143,546**

March 2017 CCI = 10278
Data From Sewer Model Data Base
Costs are in 2017 dollars

860 East Area New

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$24,196
2	8 inch PVC		LF	$80.00	$0
3	10 inch PVC		LF	$85.00	$0
4	12 inch PVC	2,350	LF	$93.00	$218,550
5	15 inch PVC		LF	$105.00	$0
6	18 inch PVC		LF	$120.00	$0
7	21 inch PVC		LF	$135.00	$0
8	24 inch PVC		LF	$160.00	$0
9	30 inch PVC		LF	$190.00	$0
10	36 inch RCP		LF	$220.00	$0
12	5 foot manholes	8	EA	$3,500.00	$28,000
13	6 foot manholes		EA	$4,500.00	$0
14	8 foot manholes		EA	$6,000.00	$0
15	Service Connections		EA	$1,850.00	$0
16	TSSD Meter Station		EA	$125,000.00	$0
17	Class "A" Road Repair (10 ft/lin ft)	11,750	SF	$4.50	$52,875
18	Imported Backfill (60 cf/lin ft)	9,400	TON	$18.00	$169,200
19	Traffic Control	1	LS	$4,371.00	$4,371
20	Bypass Pumping	1	LS	$10,927.50	$10,928
	Sub Total (Construction)				$508,120
	Contingencies	15%			$76,218
	Total (Construction)				$584,338
	Design and Construction Engineering	15%			$76,218
	Administration, Legal, and Bond Counsel	1%			$5,081
	Total (Professional Services)				$81,299
	Grand Total				**$665,637**

March 2017 CCI = 10278
Data From Sewer Model Data Base
Costs are in 2017 dollars

Southside Buildout Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$345,470
2	8 inch PVC *	20,600	LF	$0.00	$0
3	10 inch PVC	6,855	LF	$85.00	$582,675
4	12 inch PVC	13,039	LF	$93.00	$1,212,627
5	15 inch PVC	7,979	LF	$105.00	$837,795
6	18 inch PVC		LF	$120.00	$0
7	21 inch PVC		LF	$135.00	$0
8	24 inch PVC		LF	$160.00	$0
9	30 inch PVC		LF	$190.00	$0
10	36 inch RCP		LF	$220.00	$0
12	5 foot manholes	50	EA	$3,500.00	$175,000
13	6 foot manholes	25	EA	$4,500.00	$112,500
14	8 foot manholes		EA	$6,000.00	$0
15	Lift Station	1	EA	$300,000.00	$300,000
16	TSSD Meter Station	3	EA	$125,000.00	$375,000
17	Class "A" Road Repair (10 ft/lin ft)	278,730	SF	$4.50	$1,254,285
18	Imported Backfill (60 cf/lin ft)	111,492	TON	$18.00	$2,006,856
19	Traffic Control	1	LS	$52,661.94	$52,662
20	Bypass Pumping	0	LS	$131,654.85	$0
	Sub Total (Construction)				$7,254,870
	Contingencies	15%			$1,088,230
	Total (Construction)				$8,343,100
	Design and Construction Engineering	15%			$1,088,230
	Administration, Legal, and Bond Counsel	1%			$72,549
	Total (Professional Services)				$1,160,779
	Grand Total				**$9,503,880**

March 2017 CCI = 10278

Data From Sewer Model Data Base

Costs are in 2017 dollars

* Assumed that all 8 inch lines are installed by developers and not funded by impact fees.

Cedar Hills Buildout Needs *

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$40,436
2	8 inch PVC		LF	$80.00	$0
3	10 inch PVC		LF	$85.00	$0
4	12 inch PVC		LF	$93.00	$0
5	15 inch PVC (Upsize Existing)	2,700	LF	$105.00	$283,500
6	15 inch PVC (New, upsize cost contribution)	1,500	LF	$25.00	$37,500
7	21 inch PVC		LF	$135.00	$0
8	24 inch PVC		LF	$160.00	$0
9	30 inch PVC		LF	$190.00	$0
10	36 inch RCP		LF	$220.00	$0
12	5 foot manholes		EA	$3,500.00	$0
13	6 foot manholes	15	EA	$4,500.00	$67,500
14	8 foot manholes		EA	$6,000.00	$0
15	Service Connections	45	EA	$1,850.00	$83,250
16	TSSD Meter Station		EA	$125,000.00	$0
17	Class "A" Road Repair (10 ft/lin ft)	26,880	SF	$4.50	$120,960
18	Imported Backfill (60 cf/lin ft)	10,752	TON	$18.00	$193,536
19	Traffic Control	1	LS	$6,420.00	$6,420
20	Bypass Pumping	1	LS	$16,050.00	$16,050
	Sub Total (Construction)				$849,152
	Contingencies	15%			$127,373
	Total (Construction)				$976,525
	Design and Construction Engineering	15%			$127,373
	Administration, Legal, and Bond Counsel	1%			$8,492
	Total (Professional Services)				$135,864
	Grand Total				**$1,112,389**

March 2017 CCI = 10278
Data From Sewer Model Data Base
Costs are in 2017 dollars